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### Present knowledge of the Entomofauna of the Maltese Islands

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**Abstract.** The Maltese Islands' strategic position in the centre of the Mediterranean basin and in between the Siculo-Tunisian sill, always encouraged a number of foreign naturalists to visit and study their local entomofauna. A number of Maltese naturalists also contributed to such investigations. All this activity yielded a substantial amount of literature, sometimes with descriptions of possibly endemic species. Unfortunately, some of these earlier published works and those found in Maltese journals, are not easily accessible. A brief general account of the entomofauna inhabiting the Maltese Islands is provided, citing general works in which earlier citations may be found and where possible indicating lack of research on certain insect groups.

**Keywords.** Malta - Central Mediterranean - Entomofauna.

### Introduction

The Maltese Islands are a group of small, low lying islands (maximum altitude, 253 m) and consists of three inhabited Islands: Malta (surface area, 245.7 km<sup>2</sup>), Gozo (surface area, 67.1 km<sup>2</sup>) and Comino. A number of small uninhabited islets such as Cominotto, Filfola, St. Paul's Islands and Fungus Rock are also present. The archipelago is aligned in a NW-SE direction and located in the Central Mediterranean approximately 96 km from Sicily, 320 km from Tunisia and 330 km from Tripolitania (Libya). They are situated on a shallow shelf, the Malta-Ragusa Rise, part of the submarine ridge which extends from the Ragusa Peninsula of Sicily Southwards to the African coasts of Tripoli and Libya. Geologically, the islands are composed almost entirely of marine sedimentary rocks, mainly limestone of Oligo-Miocene age. The five main formations are (in order of decreasing age) Lower Coralline Limestone, Globigerina Limestone, Blue Clay, Greensand and Upper Coralline Limestone. The climate of the Maltese Islands is typically Mediterranean with a characteristic biseasonality. The average annual precipitation is approximately 500 mm. Human influence is a key feature on the islands' ecology. The first settlers on the islands cleared off most of the indigenous trees for agricultural practices. At present, the overall population density of Malta is 1095 inhabitants per km<sup>2</sup> (1985 census). A number of special habitats such as sandy beaches, salt marshes and remnants of *Quercus ilex* woods are thus under high recreational use and the fauna and flora associated with them is drastically decreasing.

### Overview

In this present work, an overview of the present state of knowledge of the entomofauna of the Maltese Islands is provided. No attempts are made to list all publications dealing with the different insect groups but rather key works are cited in which earlier citations are included there in.

Few general works on the entomofauna of the Maltese Islands have been published. In 1857 Gulia delivered a series of lectures on the insect fauna of the Maltese Islands which were published one year later GULIA, 1858). In this work a number of insects were mentioned but most identifications are considered doubtful by local entomologists. GULIA (1914) reviewed the zoological research carried out up to that date. Earlier literature on the local entomofauna was also provided there in. ANDRES (1916) published a list of Lepidoptera, Hemiptera and Coleoptera collected by himself from these Islands during the time he passed in Malta as a prisoner of war. BORG (1939) gave information on migratory insects and SALIBA (1963) gave a comprehensive list of insect pests on crop plants in the Maltese Islands. SCHEMBRI et al. (1987) indicated the presence of rare floristic and faunistic taxa (including insects) in several localities of conservational value in the Maltese Islands. More recently, SCHEMBRI (1989), SAMMUT & VALLETTA (1989) and CILIA (1989) have contributed annotated lists of endemic, rare, threatened and/or scientifically interesting species in the Red Data Book for the Maltese Islands edited by SCHEMBRI & SULTANA (1989). SCHEMBRI & LANFRANCO (1996), besides other organisms, cited a number of insects that were introduced in the Maltese Islands. MIFSUD (1997a) gave an overview of predatory and parasitic insects (introduced and indigenous), and MIFSUD & WATSON (1999) provided information on some accidentally introduced sap-feeding insect pests. FARRUGIA (1997) recorded 44 insect species from cauliflower fields in Gozo. CARUANA GATTO (1926) gave a detailed account of gall forming organisms (including insects) found in the Maltese Islands. SCHEMBRI (1993c) reviewed the present knowledge of the fauna of the Maltese Islands. This latter review was again included in the introductory part of the monograph on the non-marine molluscs of the Maltese Islands (FOLCO et al., 1995).

STACH (1967) gave a comprehensive account of the Collembola fauna of the Maltese Islands mainly based on material collected in 1924 by the Maltese Naturalist Alfredo Caruana Gatto. This work was neglected from reviews of local faunistic works (e.g. SCHEMBRI, 1989, 1993c). From this material five species were described as new and could possibly be endemic (STACH, 1963, 1967). More recently, THIBAUD & CHRISTIAN (1989) studied the interstitial Collembola from dune sand samples from Gozo (Ramla) recording eight species, two of which were described as new. No works dealing with the proturan fauna of the Maltese Islands have been published and only two species of Diplura were recorded, *Monojapyx simplex* and *Parajapyx isabellae* (PAGÉS, 1978). MENDES (1980, 1981, 1987) studied material of Archaeognata and Thysanura reviewing earlier citations and recording a total of five and seven species respectively. *Cleon dipterum* is the only recorded species of Ephemeroptera frequently found in the Maltese Islands (SCHEMBRI & SCHEMBRI, 1979). The Odonata were studied by VALLETTA (1949, 1957) who recorded one species of Zygoptera and nine of Anisoptera. CILIA (1972) furnished additional information on some of these recorded species. A number of local naturalists and foreign specialists have contributed towards the knowledge of the following insect orders occurring in the Maltese Islands. These include Blattodea, Isoptera, Mantodea, Dermaptera and Orthoptera. SCHEMBRI (1980a) reviewed the records of Blattodea recording a total of seven species. LANFRANCO (1974) mentioned two species of Isoptera and SCHEMBRI & SCHEMBRI (1978) reviewed the local Dermaptera species. *Anisolabis maritima*, recorded from two specimens from Salina (Malta), was included in the Red Data Book (SCHEMBRI & SULTANA, 1989) but in recent years it was found in

other localities both in Malta (Mellieha Bay and Dragonara) and Gozo (Qbajjar & Marsalforn Bay) (MIFSUD, unpublished data). VALLETTA (1954, 1955) contributed two extensive lists of Orthoptera of the Maltese Islands listing 37 species. BACCETTI (1973) reviewed previous works and furnished additional records. Other works which provided further information on the Orthoptera include CILIA (1975), SCHEMBRI (1984a, 1990) and SCHEMBRI & EBEJER (1983, 1984). From the Orthoptera fauna, it is note mentioning *Myrmechophilus baronii*, previously thought to be endemic, but recently reported also from Pantelleria (BACCETTI, MASSA & CANESTRELLI, 1995). Embioptera are known to occur but no studies has been published. A total of six species of Psocoptera were recorded from the Maltese Islands. These include three *Liposcelis* species (LIENHARD, 1990), of which, *L. compacta* was described as new from material collected in Algeria, France, Greece, Malta and Spain. More recently, LIENHARD (1998) added three additional species *Epipsocus lucifugus*, *Ectopsocus meridionalis* and *E. vachoni* from Malta. Future collecting may reveal that more species occur. No faunistic studies have been undertaken within the Phthiraptera even though a lot of species are expected to occur. SULTANA & GAUCI (1978) recorded two species *Halipeurus abnormis* on *Calonectris diomedea* and *Penenirmus* sp. on *Sylvia borin*. Another species *Halipeurus pelagicus* was found on *Hydrobates pelagicus* on Filfola (MEY, unpublished data, pers. comm., 1999). Table 1 summarises the data presented.

Table 1:

	Reference	Recorded number of species
Collembola	STACH, 1967; THIBAUD & CHRISTIAN, 1989	38
Dipula	PAGÉS, 1978	2
Archaeognatha	MENDES, 1980, 1981, 1987	5
Thysanura	MENDES 1980, 1981, 1987	7
Ephemeroptera	SCHEMBRI & SCHEMBRI, 1979	1
Odonata	VALLETTA, 1949, 1957	10
Blattoidea	SCHEMBRI, 1980a	7
Isoptera	LANFRANCO, 1974	2
Mantodea	BACCETTI, 1973	4
Dermaptera	SCHEMBRI & SCHEMBRI, 1978	5
Orthoptera	BACCETTI, 1973; SCHEMBRI & EBEJER, 1983, 1984	45
Psocoptera	LIENHARD, 1990, 1998	6

Until recently, the study of the Hemiptera fauna of the Maltese Islands was mostly neglected. Within the Sternorrhyncha, 18 species of Psylloidea have been asserted to occur in the Maltese Islands (MIFSUD, 1997c, 1999b). The whitefly fauna (Aleyrodoidea) was also studied with 13 species recorded (MIFSUD, 1995). One species, *Aleurolobus teucrii*, was described as new from material collected in Malta and Sicily (MIFSUD & PALMERI, 1996). The Coccoidea was reviewed by BORG (1932) listing a total of 59 species. Additional species are known to occur and a review of the species found in the Maltese Islands is underway (MIFSUD & WATSON, in prep.). In local faunistic works, *Lacombia urbanii* described by BORATYNSKI (1968), was always cited as endemic, but this was synonymised with *L. dactyloni* almost ten years ago (BEN-DOV, 1990). Despite

their economic importance, the Aphidoidea were only marginally studied. CARUANA GATTO (1926) recorded species causing plant galls while SALIBA (1963) and FARRUGIA (1997) listed species of economic importance. Some 100 species are known to occur (MIFSUD, 1997a) and a review of the species occurring in the Maltese Islands is also underway (MIFSUD & WATSON, in prep.). A previously taught endemic species, *Protrama baronii*, was recently recorded from Southern Italy (BARBAGALLO et al., 1995). There seem to be no published works on the Auchenorrhyncha of the Maltese Islands. One frequent species, *Cicada orni*, is known to occur but many additional species wait formal study. A list of Heteroptera from the Maltese Islands was published by SCHEMBRI (1993a) in which earlier citations were reviewed. A total of 206 species (excluding three not identified to species level) were included. More recently, CARAPEZZA (1995) reviewed the Heteroptera of Pantelleria and the Pelagie Islands, providing an updated list, in which all Maltese citations were included with corrections. Little data has been published on the Thysanoptera fauna of the Maltese Islands and only species of economic importance have been listed (SALIBA, 1963; MIFSUD & WATSON, 1999). Recent collections are currently under study (MARULLO & MIFSUD, in prep.). The Neuropteran fauna was reviewed by PLANT & SCHEMBRI (1996) in which available previous records were included. A total of 29 confirmed species were listed and a further two that could not be identified to specific level.

Compared with other insect groups occurring in the Maltese Islands, the Coleoptera was more thoroughly studied. CARUANA GATTO (1894) published a list of common beetles and later he co-authored a list of Coleoptera from the Maltese Islands (CAMERON & CARUANA GATTO, 1907) mentioning some 700 species. This latter work, is still the only one dealing with all Coleoptera. CARUANA GATTO (1925) discussed how a number of Coleoptera species almost disappeared from certain localities since the publication of the Coleoptera list. TONNA-BARTHET (1931) published a list of rare Coleoptera and recently, CILIA (1989) gave an account of rare and endemic Coleoptera found in the Maltese Islands. Since CAMERON & CARUANA GATTO's list, a number of families have been studied. Table 2 provides references for such families and Table 3 indicates how, in some groups, the current number of species has doubled or almost so in number. It is outside the scope of the present work to note all single Coleoptera citations from Malta in various revisionary works. It is hoped that these will be included as other families are investigated on a local scale. However, some general comments on certain species are here included especially where the current knowledge seems to be lacking in local faunistic overviews. *Stenostoma melitense* (Oedomeridae) is endemic to the Maltese Islands. Until recently, it was thought to be present also in Pantelleria (BOLOGNA, 1984) but this population proved to be a distinct species, *S. cossyrense* (BOLOGNA, 1995), closely related to *S. melitense*. *Anthicus (Aulacoderus) melitensis* (Anthicidae) was known from the type material and never again collected in Malta (SCHEMBRI, 1991a). VAN HILLE (1984) proposed a sub specific ranking for this taxon, *A. (Aulacoderus) sulcithorax melitensis*. *Timarcha melitensis* (Chrysomelidae) was thought to be an endemic species but since its original description it was never again collected from Malta. Recent investigations indicated that this could have been described from a similar type locality name in Spain (JOLIVET, 1996). In the 1907 Coleoptera list, CAMERON & CARUANA GATTO listed *Anthaxia umbellatarum* from Gozo. LEVEY (1985) studied this material and described it as a new species, *A. scylla* from material collected in Malta and Sicily. Within the

Curculionidae, a number of endemics are present and the whole group is at present under study (MIFSUD & MAGNANO in prep.). New endogean species were recently collected, of which, *Alaocyba melitensis* have already been described (MAGNANO & MIFSUD, 1998). An apparently new species of *Trachyphloeus* recorded in the 1907 list, was recently described from material collected in Malta and Lampedusa (BOROVEC & OSELLA, 1993). Three different species of *Otiorhynchus* are endemic to the Maltese Islands. These include *O. (Arammichnus) moriger*, *O. (Arammichnus) ovatulus* and *O. (Arammichnus) schembrii* (MAGNANO, 1992a, 1992b, 1993). Another possibly endemic species is *Chiloneus hoffmanni* (GONZALEZ) [= *Desbrochersella hoffmanni* GONZALEZ = *Chiloneus deluccai* PESARINI] (GONZALEZ GUTIERREZ, 1970; PESARINI, 1970, 1980).

Table 2:

	Reference	Recorded number of species
Gyrinidae, Haliplidae	ROCCHI & SCHEMBRI, 1992	16
& Dytiscidae		
Carabidae	MAGRINI & SCHEMBRI, 1997; MIFSUD & VIGNA TAGLIANTI, 1999	134
Histeridae	VIENNA, 1983	21
Schydmaenidae	POGGI, 1980	4
Staphylinidae	POGGI, 1980, 1999; BORDONI, 1973; SCHEMBRI & SCHEMBRI, 1982	c.200
Scarabaeidae	SABATINELLI & SCHEMBRI, 1990	9
Heteroceridae	MIFSUD & MASCAGNI, 1997	1
Elateridae	PLATIA, 1985	7
Cleridae	MIFSUD, 1997b	6
Coccinellidae	SCHEMBRI, 1993b	34
Tenebrionidae	MIFSUD & SCUPOLA, 1998; MIFSUD, 1999a	58
Oedemeridae	BOLOGNA, 1995	5
Meloidea	BOLOGNA, 1995	8
Anthicidae	SCHEMBRI, 1991a	18
Cerambycidae	SCHEMBRI & SAMA 1986; MIFSUD & BOOTH, 1997	30
Curculionoidea	CILIA, 1974; MAGNANO & OSELLA, 1973	c.100

Table 3:

	Number of species recorded in 1907	Number of species currently known
Pselaphidae	4	9
Tenebrionidae	37	58
Cerambycidae	14	30
Coccinellidae	14	34

Even though the study of the Maltese Coleoptera seems to be satisfactory, for at least some groups, specialised field investigations are lacking. During 1995 to 1997, a research study was undertaken to evaluate the possible presence of endogean and epigeal Coleoptera. This revealed the presence of several genera most of which never recorded from the Maltese Islands, eg. *Metophthalmus* WOLLASTON, *Langelandia* AUBÉ, *Anommatus* WESMAEL, *Alaocyba* PERRIS, *Torneuma* WOLLASTON, *Cephennium* MÜLLER

& KUNZE, *Scydmoraphes* REITTER, *Pseudoeudesis* BINAGHI, *Amaurops* FAIRMAIRE, *Gynotiphylus* COIFFAIT, *Geostiba* THOMSON and *Alevonota* THOMSON, some of which appear to be new to science and possibly endemic (MAGNANO & MIFSUD, 1998; POGGI, 1999; PACE, 1999). It is estimated that some 1800 species of Coleoptera occur in the Maltese Islands and a new catalogue is currently in preparation (MIFSUD in prep.).

Within the Strepsiptera, only one species was recorded, *Mengenilla chobauti* (SCHEMBRI, 1984b). Nine species of Siphonaptera are known from the Maltese Islands. Six species were recorded (BERNARD, 1937; TRAUB et al., 1983; BEAUCOURNU & ALCOVER, 1990; BEAUCOURNU, 1990) of which a new subspecies *Leptopsylla algira vogeli*, was described from material collected on *Crocidura sicula* from the Island of Gozo. Three cosmopolitan species, *Pulex irritans*, *Ctenocephalides felis felis* and *C. canis* were recently studied by the present author from material collected in Malta. More species of Siphonaptera are expected to occur in the Maltese Islands. Due to the lack of permanent freshwater bodies, Trichoptera species are quite rare. Two species were recorded by SCHEMBRI & JOHNSON (1987), *Tinodes maclachlani* and *Mesophylax aspersus*.

The most comprehensive account of Diptera occurring in the Maltese Islands was provided by SCHEMBRI et al. (1991), listing a total of 203 species from 27 families. Most of the earlier literature on the group was included therein. Recently, LÉGER et al. (1991), studied more than 16,000 specimens of sandflies (Phlebotominae) collected from Gozo, represented by six species. EBEJER (1995a) recorded the snail-killing fly *Pherbellia cinerella*, and (EBEJER, 1995c) provided notes and new records on the larger Brachycera of Malta, listing 7 species in Statiomyidae, 1 of Vermileonidae, 1 of Rhagionidae, 3 of Tabanidae, 3 of Therevidae, 7 of Asidae and 2 each in Scenopinidae and Acroceridae. PLANT (1995) studied the *Chersodromia* (Empidoidea, Hybotidae) of the Maltese Islands describing two new species. Some of the better studied families are included in Table 4 with corresponding reference and number of species recorded.

Table 4:

	Reference	Recorded number of species
Syrphidae	EBEJER, 1988b, 1995b	46
Bombyliidae	EBEJER, 1988a, 1995c	27
Chyromyidae	EBEJER, 1993	7
Culicidae	GATT, 1996	9

An extensive literature is known on the Lepidoptera of the Maltese Islands. It is outside the scope of the present work to cite these references most of which are included in a recent catalogue of Maltese Lepidoptera (SAMMUT, 1984) in which a total of 590 species were included. SAMMUT & VALLETTA (1989) treated the endemic and or threatened Maltese Lepidoptera fauna while SAMMUT (1989) in a semi-popular article, gave a general overview of lepidopterological studies in the Maltese Islands. More recently, in a distributional checklist of the Lepidoptera of Europe (KARSHOLT & RAZOWSKI, 1996), a total of 554 species were included from Malta of which 15 were listed as endemic. Species of doubtful occurrence in the Maltese Islands were excluded from this checklist, and since then some 10-15 new records were found and some recorded endemic species

were collected from Sicily (SAMMUT, P. pers. comm., 1999). Two new species were recently described, *Hyles sammuti* (DANNER et al., 1998) and *Dysspastus lilliput* (GOZMANY, 1996). Currently some 570 species are known to occur in the Maltese Islands.

A number of general works on Hymenoptera have been published listing species from the Maltese Islands (eg. ALFKEN, 1929; VALLETTA 1971, 1978; ERLANDSSON, 1974, 1979, 1984). SCHEMBRI (1982) provided a list of 40 species of Apoidea but commented that many more species are known to occur. SCHEMBRI (1980b, 1985) recorded some twenty species of Vespoidea. Table 5 provides information on the better studied Hymenoptera families.

Table 5:

	Reference	Recorded number of species
Formicidae	BARONI URBANI, 1968; SCHEMBRI & COLLINGWOOD, 1981, 1995; COLLINGWOOD, MEI & MIFSUD, 1999	55
Mutillidae	SCHEMBRI, 1983	15
Chrysididae	STRUMIA, 1981	18
Sphecidae	SCHEMBRI, 1991b	55
Pompilidae	WAHIS, 1997	27
Ichneumonidae	SCHEMBRI, 1992a	24

A number of parasitic and hyperparasitic Hymenoptera species have been recorded from the archipelago. Most of the early records were included by MIFSUD (1997a) in his overview of biological control in the Maltese Islands. The most recent works include those of MIFSUD et al. (1995) treating species developing in whitefly larvae; MIFSUD (1997c, 1999b) referring to parasitic species occurring in psyllid larvae; and FARRUGIA (1998) indicating species associated with scale insects infesting citrus. In these three main works the following families were included: Aphelinidae (16 species), Encyrtidae (10 species), Eulophidae (6 species), Pteromalidae (2 species), Mymaridae (1 species), Signiphoridae (2 species) and Platygastriidae (1 species). SCHAUFF et al. (1998) mentioned *Cirrospilus pictus* (Eulophidae) as a parasite of the Citrus Leafminer and FARRUGIA (1999) recorded four *Leucospis* species (Leucospidae) from the Maltese Islands. It is estimated that several hundred species of such Hymenoptera occur locally.

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